Bang Pla treatment plant, Samut Sakhon province, Thailand. Photo: Suraj Pradhan, AIT (Jan 15, 2020)

POLICY BRIEF

"Applying sanitation value chain approach towards appropriate wastewater and faecal sludge management in Thailand"

JUNE 2020

Key Policy Messages

- It is important to define "sanitation" more broadly considering the whole sanitation service chain, as the entire community, as well as downstream populations must be protected from discharge of untreated wastes, including wastewater (both black and gray) and faecal sludge (FS) generated from the on-site sanitation systems (OSS).
- The dominant leaching nature cesspools (about 90%) are the major contributor of the domestic wastewater pollution. Therefore, upgrading these existing cesspool systems by sealing the bottom by introducing proper faecal sludge management (FSM) system or be fully replaced with reinvented toilet technologies is a strategic and long-term solution not just from the management and technological point of view but for monitoring and containing the pandemic.
- It is reported that only about 27% of generated wastewater (black and grey combined) is safely treated at 105 centralized wastewater treatment plants across the country whereas the remaining 73% is discharged to receiving water bodies. One of the main reasons for this low ratio of wastewater treatment is the requirement of huge investment costs for construction of centralized wastewater treatment plants, which is often not financially viable for short and medium term.
- To close the gap, the solution here is to have less capital intensive – which, needs to be adopted. Thus, integration of decentralized wastewater treatment systems is effective to supplement centralized system, due to its competitive advantages of cost, area and just-in-time nature, making wastewater management more accessible, especially in urban and peri-urban settings.
- Zoning of the areas for different on-site sanitation system schemes with FSM i.e. decentralized, and centralized or their combination – considering population density while paying attention to underlying aquifers.
- Overlapping institutional roles should be resolved through proper capacity building of the institutions and frequent policy dialogues among responsible ministries and governmental agencies.
- Encourage community involvement in determining the appropriate treatment systems based on the local capacity and reuse options. Periodic survey for willingness to pay and the tariffs while policy stimulus is required to establish standards for FSM and to streamline tariff collection process for both wastewater treatment and FSM services.
- Encourage private involvement as investors while government creates the enabling environment for private investment and return.

IGES Institute for Global Environmental Strategies

AIT Asian Institute of Technology

OVERVIEW

Thailand is at the heart of Southeast Asia with nearly 64 million inhabitants. Although there has been significant improvement in sanitation in terms of limiting the direct human contact with the excreta and achieving 99.8% of universal coverage of improved sanitation by 2017, the country still faces drawbacks in terms of second-generation waste management – FS and wastewater due mainly to the lack of effective government administration and limited treatment facilities. Therefore, policy intervention is required to establish standards for wastewater and FSM as well as to streamline the tariff collection process. Apart from institutional improvements, it is important to raise awareness among the public to ensure their fullest cooperation in implementing sanitation related legislations and practices.

Wastewater Sector's Performance in Thailand

In Thailand, Decentralized Wastewater Treatment Systems (DEWATs) usually comprise of on-site and clustered systems. However, the size of community or size of catchment is not specifically defined for the clustered systems and the specific definition of DEWATs does not exist. Clustered wastewater treatment systems have received their name or status based on the treatment capacity size by different organization. For example, based on the list of treatment technology provided by Thailand's Pollution Control Department (PCD), under the Ministry of Natural Resources and Environment (MoNRE), the capacity of the clustered treatment technology is less than 1000 cubic meters per day. However, the National Housing Authority owned clustered treatment system has the capacity less than 5000 cubic meters/ day. In Thailand, DEWATs are the miniature form of centralized systems – type of technologies used are: activated sludge, oxidation ditches, waste stabilization ponds, aerated lagoon as clustered systems depending on the capital cost, area availability and ease of operation and maintenance.

Thailand produces about 9.8 million m^3 of domestic wastewater per day of which the black water is preliminarily treated at the on-site sanitation systems (OSS) of each household while gray water is directly channeled to sewer or drainage network. Despite the universal coverage of the toilet facilities and on-site sanitation system, the treatment performance of OSS is poor attributing to the leaching liquid effluent with limited treatment (about 90% being cesspools). Of the total produced volume, only about 27% is safely treated at 105 central wastewater treatment plants and less than 1% at the clustered wastewater treatment plants whereas the remaining 73% is discharged to receiving water bodies untreated risking public health. This can also be attributed to the poor households' connection to the sewer network. Similarly, the FS volume of 40,000 m^3 is collected from OSS everyday of which only 12% undergoes treatment at the FS treatment plants while 88% is either dumped into the open drains or waterways and/or farmlands. Treatment plants are usually designed at 200 mg/liter BOD, but influent BOD concentration is found at lower than 80 mg/liter – as wastewater undergoes primary treatment in septic tanks and dilution in the ageing sewer network by groundwater intrusion. Further, the landscapes around Bangkok and most urban cities in Thailand holds low gradient, requiring the exhaustive pumping to channel wastewater to treatment plants making them the energy intensive and expensive for operation.

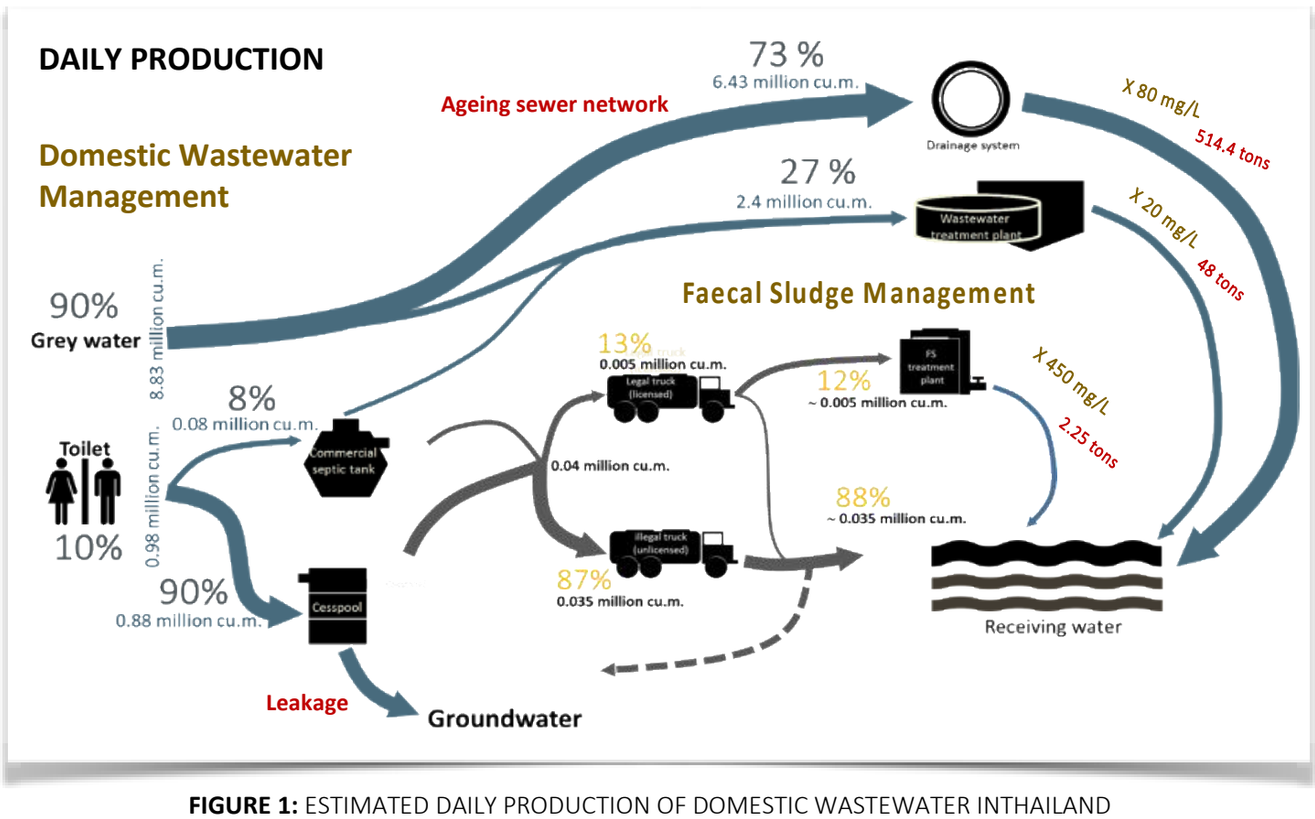
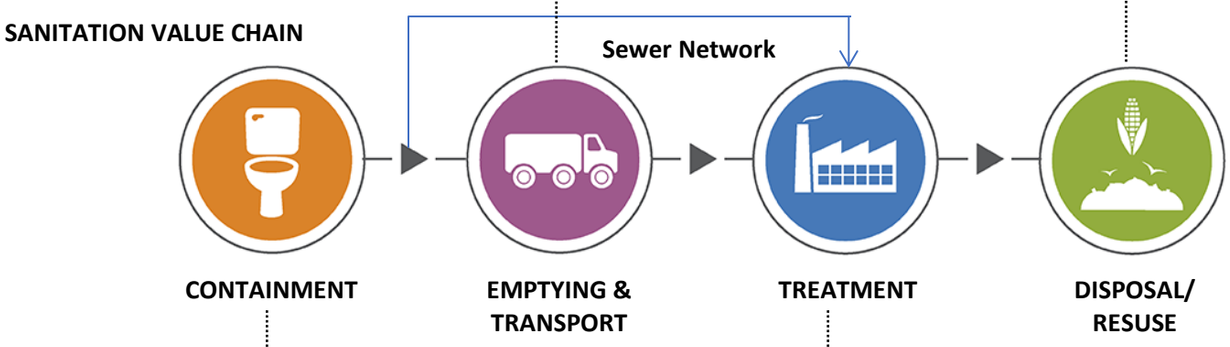


FIGURE 1: ESTIMATED DAILY PRODUCTION OF DOMESTIC WASTEWATER INTHAILAND
[developed by Dr. Yuttachai Sarathai (AIT), 2017]

WHAT BARRIES DOES THAILAND FACE WHILE IMPLEMENTING DEWATs and FSM?

- FS emptying services performance are not regulated.
- No regular emptying mechanism – service is on-call basis
- FS transport services are informal to which the local governments are unable to track and formalize.
- Poor sewer connection and aging sewer network
- Low gradient and high pumping requirement

- Reuse of treated wastewater is still not a priority and at scale
- No monitoring on the quality of dried FS for use.
- Assessment of market potential of the treated products not in practice.



Design: International Water Management Institute, 2016

- Cesspool is predominant – leaking bottom leading to water pollution.
- Households operate and maintain their OSS without monitoring mechanism - resulted in the impaired functionality.
- No enforcement available on operation and maintenance of septic tank and cesspool.
- Cesspool is cheaper to operate and does not require frequent emptying. It is perceived as additional burden and people are not willing to upgrade.

- Guidelines and FSM are still not a priority for National Government and Local Government Authorities (LGAs).
- LGAs lack capacity and skills to build and operate wastewater and FS treatment plants.
- Stringent effluent standard considering the level of treatment required to meet the prescribed effluent standard – independent of the nature of locality, receiving water bodies and reuse potential of wastewater.
- No available monitoring programs on effluent and solid standard for FSM.
- Limitation on the implementation of discharge fee has resulted in insufficient funds to operate and maintain treatment plants.

Additionally, the decentralized approach is relatively new and has not yet been part of the Thailand's city sanitation plan at scale despite their cost effectiveness, coverage, end-product reuse, etc. Private sector involvement is still limited to operation and maintenance as contracted by the government. The enabling environment for the private sector involvement is lacking as government fails to ensure the mechanism of cost recovery. Recent initiative of Thailand Industrial Standard Institute's (TISI) standard on the material and treatment performance of septic tank is voluntary leading to compromised product quality and unhealthy market competition.

Good practice in Thailand: Case of Nonthaburi

The treatment plant of 40 m^3/day capacity serving roughly half the population of municipality employs anaerobic tanks (30 tanks), sludge drying bed (30 beds) and an oxidation pond (1) to transform FS into organic fertilizer. It is a batch type culture where the FS is filled in the tank for 28 days. After the anaerobic process is complete, the sludge is released to sand drying beds where the liquid infiltrates and the solid dries. It roughly treats 50% of the FS emptied.

There are 2 products produced from the FS treatment plant; dried sludge and treated effluent. Dried sludge generation is approximately 80 ton/year which is sold to the farmers on about 3000 Baht/ton. The liquid part from the plant is drained and collected into the effluent storage pond with aerators which they use for plant watering within the treatment plant. The products from each step of FS treatment plant will be checked for the quality of the dried sludge.

KEY POLICY RECOMMENDATION – "Shifting the Sanitation Paradigm"

Consider full range of sanitation options

- It is of utmost necessity to redefine sanitation to encompass the whole sanitation chain to ensure the public and environment safety of both the community and downstream settlements.
- The service chain in terms of sewerage system encompasses the increased sewer connections, regular maintenance of the aging sewers, gravity flow mechanism or alternative pumping system (solar pumping) wherever possible.
- Similarly, for FSM, regular maintenance and frequent emptying of the OSS, safe handling during emptying and transportation.
- Define zones for "Centralized", "Decentralized" and "OSS" and their combination while introducing environmentally sustainable technologies (e.g. nature-based solutions for wastewater treatment), targeting urban poor, with low greenhouse gas (GHG) emission.

Upgrading the existing on-site sanitation system

- Considering the outbreak of global pandemic (Covid-19) and detection of traces in wastewater and FS samples with the life span of 3 - 4 days, it is of utmost importance to contain the FS and wastewater safely. Upgrading cesspool in the older households to seal the bottom is paramount to check the pollutants leaking into the environment. The septic tank with sealed bottom with similar design to cesspool is comparable in-terms of cost has the better treatment performance.
- Employ innovative technologies like solar septic tanks where applicable and affordable as they are easy to install and readily available.
- The government has plan to address housing problems of 3 million urban poor scaling up the projects "Baan Mankong (Affordable housing)" and "Baan Ua Arthorn (we care)" that started in 2003 through the 20-year housing development master plan (2017-2036). The policy must extend beyond just house to cover sanitation as well as sewerage connection.
- Mandate TISI standard for DEWATs for quality product and healthy market.
- Encourage households for the proper operation and maintenance (O&M) of OSS
- Check the sludge accumulation every 2 years and implement regular desludging service every 3-5 years.

Mixed Sanitation Approach

- Develop a citywide sanitation planning covering intricate mosaic of "Centralized, DEWATS and OSS" and FSM or blend of these technologies weighing their suitability considering the population density, local capacity as well as the sensitivity of the area – mix sanitation approach as one-size-fits-all solution is non-existent.

Bridge sector gaps while adopting the utility approach for effective wastewater management

- Effective co-ordination with frequent policy dialogue is required to avoid gaps and overlapping in the policies as well as scope of responsibilities.
- Synchronize water supply utilities, wastewater/FS – related agencies into a single authority.
- Raise political will and simplify mechanisms to tap the fund from central government with aided or minimal document requirement.
- Enforcement of the regulatory instruments (related laws and effluent standards) and economic instruments (EI) like polluter pay principle, beneficiary pay principle, wastewater tariff at the highest ability.
- Incorporation of special provision of wastewater-based epidemiology (WBE) mechanism for wastewater monitoring provides a key tool in identifying and containing the pandemic at community level. WBE measures chemical signatures in sewage, such as fragment biomarkers from the virus such as COVID-19, by applying the type of clinical diagnostic testing (designed for individuals) to the collective signature of entire communities.

Reuse based technology choice and effluent standard

- Under proper operation, wastewater stabilization ponds (WSPs) could serve as fish farm, while the treated water as the cheap source of irrigation water. Similarly, several resource recoveries for FS treatment plants are already in practice in Thailand (Nonthaburi – biofertilizer, Thongtawil – electricity). The revenue from the sales of the recovered products can partly compensate the O&M cost of the plant.
- There are plans to construct 741 wastewater treatment plants during 2020-2040 and additional 100 treatment plants in another 5 years. However, it is not clear on what type and methodology of treatment system will be built. Therefore, the approach must be made clear to the local authority to incorporate into their action plan or city sanitation plan for smooth implementation.

- Effluent standard must be devised based on the reuse options, sensitivity of the area and the assimilative capacity of receiving water bodies. It is necessary to develop the liquid effluent and treated solid standards for FSM.

Promote public awareness and encourage participation

- Public involvement in decision-making ensures greater acceptance of the policy and end products.
- Public awareness campaign and survey should be carried out frequently to ensure public participation.
- For the treatment systems to be sustainable, the implementation of economic instrument is a must with periodic survey for willingness to pay to streamline the stepped tariff increment. The success of the EI largely depends on the public participation and understanding.

Encourage private investment beyond contract-based services

- Ensure tariff implementation with O&M requirements.
- Incentivize private sector to avoid economic spillover in long run.
- Create enabling environment for private investment and return.
- The water resources master plan is likely to channel a lot of investment in wastewater treatment plants, ways to encourage and involve private sector is needed.

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